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Constraining hydrostatic mass bias and cosmological parameters with the gas mass fraction in galaxy clusters

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The gas mass fraction in galaxy clusters is a convenient tool to use in the context of cosmological studies. Indeed this quantity allows to constrain the universal baryon fraction Ω_b/Ω_m, as well as other parameters like the matter density Ω_m, the Hubble parameter h or the Equation of State of Dark Energy w.

This gas mass fraction is also sensitive to baryonic effects that need to be taken into account, and that translate into nuisance parameters.
Two of them are the depletion factor Υ and the hydrostatic mass bias $B = (1 - b)$.
The former describes how baryons are depleted in clusters with respect to the universal baryon fraction, while the latter encodes the bias of the mass derived from X-ray observations under the hypothesis of hydrostatic equilibrium.

We will show preliminary results, based on the {\it Planck}-ESZ clusters observed by XMM-{\it Newton}, on both cosmological and cluster parameters.

We will notably discuss our investigation on a possible redshift and mass dependence of the mass bias, which is considered to be non-existent in hydrodynamic simulations based on Λ-CDM, and compare our results with other studies.

Finally we show that our results on the mass and redshift evolution of the mass bias exhibit a sample dependent behaviour, especially given particular mass and redshift selections.
An evolution of the bias nevertheless needs to be taken into account to derive robust cosmological constraints as we show a degeneracy between a redshift dependence of the bias and cosmological parameters.

Field

Cosmology

Day constaints

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